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QUALIFICATION: **BACHELOR of MEDICAL LABORATORY SCIENCES**	
QUALIFICATION CODE: **08BMLS**	LEVEL: **6**
COURSE: **MOLECULAR DIAGNOSTICS**	COURSE CODE: **MOD621S**
DATE: **DECEMBER 2025**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER

EXAMINER: *Ms Vanessa Tjijenda*

MODERATOR: *Dr Taime Sylvester*

INSTRUCTIONS:

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. Non-Programmable Calculator

ATTACHEMENTS

1. None

This question paper consists of 5 pages including this front page.

SECTION A: [20 MARKS]

QUESTION 1: [20 MARKS]

Differentiate between the following:

1.1 Primers melting and annealing temperature. (2)

1.2 Northern and Southern Blotting techniques. (2)

1.3 0.8 % agarose gel and 2% agarose gel in relation to DNA movement. (2)

1.4 Multiplex PCR and Microarray. (2)

1.5 T4 Polynucleatide Kinase and S1 Nuclease. (2)

1.6 Annealing and Extension processes in PCR. (2)

1.7 RFLP and VNTR. (2)

1.8 Palindrome and PCR target sequence. (2)

1.9 Isopropyl alcohol and sodium acetate during DNA extraction. (2)

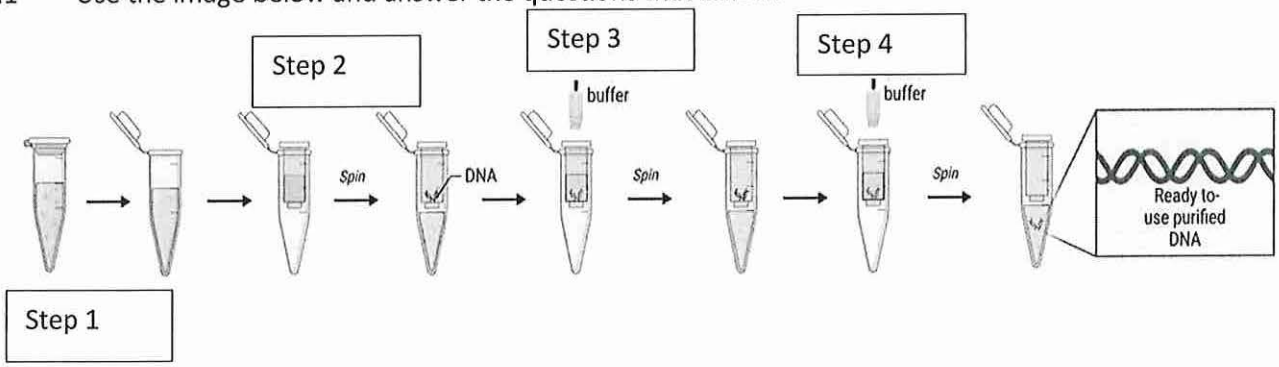
1.10 PCR copies in cycle 3 and 14. (2)

SECTION B: SHORT ANSWER QUESTIONS [60 MARKS]

Please answer ALL of the questions in this section.

QUESTION 2 [37]

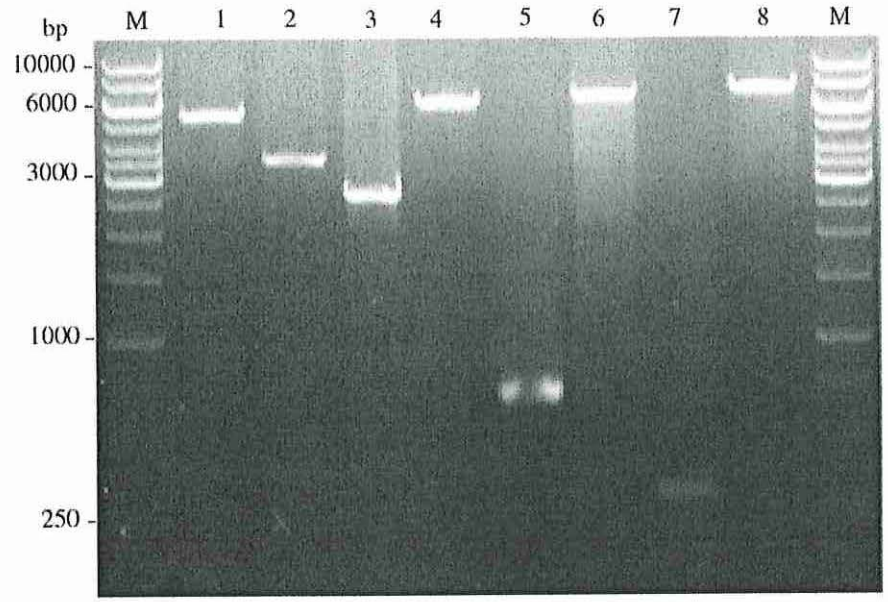
2.1 Use the image below and answer the questions that follow:



2.1.1 Identify the buffers added to step 1, 3 and 4 in the image above of the spin-column (6)

2.1.2 Identify any four of the components in the buffer in step 1. (4)

2.2 You perform an agarose gel electrophoresis of your PCR products. Below image is obtained from the Gel Imaging System. Answer the questions based on the results.



Note: Lane 7 is your negative control and Lane 8 is your positive control.

2.2.1 Identify the reagents used in gel electrophoresis and mention their functions. (10)

2.2.2 Summarize the steps involved in agarose gel preparation. (10)

2.2.3 Infer the percentage of the gel used? Defend your answer? (2)

2.2.4 Deduce the size of the bands in Lane **4 and 5**? (2)

2.2.5 Comment on the reliability of the results obtained. (3)

QUESTION 3 [11]

3.0 The results from the image below are obtained from 33 years old, pre B ALL male patient with aberrant CD13 and CD33. Analyse the results below and answer the questions that follow.

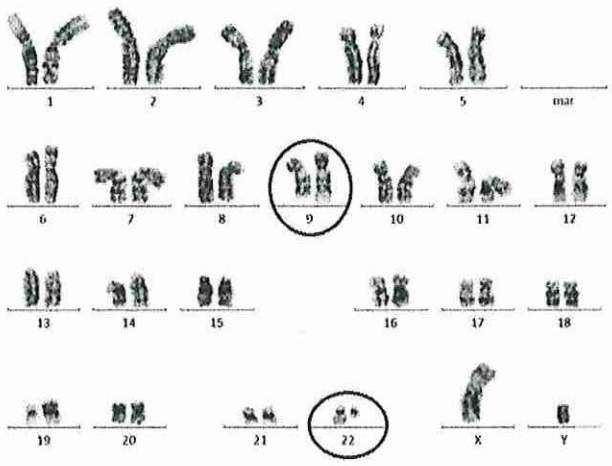


Figure 1

3.1 Identify the method performed in **Figure 1** above. (1)

3.2 Interpret the results and propose a diagnosis for the patient. (4)

3.3 Discuss the use of In Situ Hybridization technique in cytogenetics. (6)

QUESTION 4: [12]

4.1 Briefly explain what happens during the following steps of Western blotting:

4.1.1 Gel electrophoresis (2)

4.1.2 Protein transfer (2)

4.1.3 Blocking (2)

4.1.4 Antibody Probing (2)

4.1.5 Detection (2)

4.2 Explain the purpose of Western blotting in molecular biology. (2)

SECTION C: LONG ANSWER QUESTIONS [20 MARKS]

Please answer ALL of the questions in this section.

QUESTION 5:

5.1 You are interested in doing Cross-species studies for your Masters degree. You are particularly interested in studying gene expression in a closely related species. Using hybridization techniques, explain step by step how you will achieve this. (10)

5.2 The Conventional PCR method can be modified to increase specificity. One such technique is Hot Start PCR, explain in detail how specificity is achieved in this method (10)

END OF QUESTION PAPER